

# A single-institution experience with hydrostatic reduction for childhood intussusception: a preliminary report

Olumide A. Elebute<sup>a</sup>, Adesoji O. Ademuyiwa<sup>b</sup>, Hestia O.A. Idiodi-Thomas<sup>a</sup>, Felix M. Alakaloko<sup>a</sup>, Justina O. Seyi-Olajide<sup>a</sup> and Christopher O. Bode<sup>b</sup>

**Background/purpose** Hydrostatic reduction for intussusception has the benefit of achieving reduction without the need for general anaesthesia or surgery and the possible attendant complications. This has made it the most popular interventional modality in many centres today. Hydrostatic reduction was added to our armamentarium in the treatment of childhood intussusception recently and this report represents our initial experience.

**Methods** This study is a prospective review of all cases of intussusception that presented at the Emergency Department at the Lagos University Teaching Hospital between February 2012 and May 2014. Eligibility for hydrostatic reduction was based on internationally recognized criteria, which included absence of peritonitis and shock. Data were analyzed using the statistical package for social sciences (version 20). The  $\chi^2$ -test was used to compare categorical variables, and a *P* value of 0.05 was considered significant.

**Results** A total of 66 patients were seen within the study period. Thirty-eight were male (57.6%) and 28 were female (42.4%). The age range was 3–84 months and the mean age was  $12.0 \pm 30.8$  months. Twenty-six patients (39.4%)

underwent hydrostatic reduction, of which 11 (42.3%) were successful. There was a correlation between the duration of symptoms and successful hydrostatic reduction ( $P < 0.05$ ), with five of the 11 (45.5%) presenting within 24 h of symptoms.

**Conclusion** Although less than half of the patients presenting with childhood intussusception were eligible for hydrostatic reduction, the method remains a feasible option in our environment in spite of late presentation by most of our patients. The duration of presenting symptoms was the most important determinant of successful hydrostatic reduction. *Ann Pediatr Surg* 12:47–49 © 2016 Annals of Pediatric Surgery.

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<sup>a</sup>Paediatric Surgery Unit, Department of Surgery, Lagos University Teaching Hospital, Idi-Araba and <sup>b</sup>Paediatric Surgery Unit, Department of Surgery, College of Medicine, University of Lagos, Lagos, Nigeria

Correspondence to Olumide A. Elebute, FWACS, Paediatric Surgery Unit, Department of Surgery, Lagos University Teaching Hospital, PMB 12003 Idi-Araba, Nigeria  
Tel: + 234 802 307 4898; e-mail: doctoroe@hotmail.com

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## Background/purpose

Intussusception is the telescoping or the invagination of a part of the bowel into an adjacent, usually the distal, segment of the bowel [1]. It is the most common cause of childhood intestinal obstruction accounting for an estimated 30% of all cases of intestinal obstruction presenting at the emergency department in some centres in Nigeria [2,3]. The condition is amenable to nonoperative and operative management depending on the presentation [4]. The benefits ascribable to hydrostatic reduction have made it the most popular interventional modality in many centres today [5]. Apart from its cost-effectiveness, hydrostatic reduction with saline does not expose the patient to the ill effects of ionizing radiation [4]. Hydrostatic reduction was added to our armamentarium in the treatment of childhood intussusception 4 years ago. We present a preliminary report of our experience with the use of this treatment modality at our centre.

## Methods

This study is a prospective review of all cases of intussusception presenting to the Children Emergency Department at the Lagos University Teaching Hospital between February 2012 and May 2014. Approval for the study was obtained from the Hospital's Ethical Committee.

Eligibility for hydrostatic reduction was based on internationally recognized criteria, which included the absence of peritonitis and shock [6,7].

Patient's biographic data, symptoms such as passage of red currant jelly stool and salient clinical findings and ultrasonographic findings were noted. Outcome measures for the study were unsuccessful and successful reduction.

The data collated were analyzed using the Statistical package for Social Sciences (SPSS), version 20 (IBM SPSS Statistics for Windows, version 20.0; IBM Corp., Armonk, New York, USA). The  $\chi^2$ -test was used to compare categorical variables and a *P* value of 0.05 was considered significant.

Hydrostatic reduction is performed once the patients have been adequately resuscitated as judged by urinary output 1–2 ml/kg body weight. The procedure is performed at the Radiology Department by the senior registrar or the consultant on call in conjunction with an experienced sonologist usually in the rank of a senior registrar.

We routinely use normal saline for the reduction. Consent for the procedure is obtained from the parent/guardian,

which includes surgery in case there is a failed reduction and the need for operative reduction in such instances.

The patient is positioned supine on a well-padded couch. The patient's vital signs are observed throughout the procedure. A Foley's catheter of French size 20–22 is inserted into the rectum and the balloon inflated with about 10 ml of saline or water for injection. A pint (500 ml) of normal saline is suspended on a drip stand about 1 m above the level of the couch and connected to the Foley's catheter so as to generate a pressure of 100 cm of water. The fluid is instilled into the rectum and the reduction is monitored sonologically (using a Toshiba Ultrasound machine with a transducer of 3.5 MHz, Toshiba Medical Systems Corporation, Minato-ku, Tokyo, Japan), looking out for evidence of successful reduction, which included the disappearance of the target sign, pseudokidney, or the reflux of fluid into the terminal ileum. No more than three attempts at reduction are made. Occasionally, an antispasmodic (i.e. parenteral hyosine) is administered at a dose of 5 mg bolus to facilitate reduction. The catheter is removed if reduction is successful and the patient is then transferred to the ward for close observation. Oral intake is resumed gradually after ascertaining the return of bowel sounds, usually within 3–6 h of the procedure. The patient is subsequently discharged home once normal oral intake is tolerated, typically within 24 h of ward admission after informing the parents/caregiver to be on the lookout for symptoms of recurrence such as the ones the patient presented with. The patient is followed up at the outpatient clinic and eventually discharged from our care after a single visit.

Those without overt sonological evidence of reduction or whose symptoms had recurred after an initial successful reduction were operatively reduced.

## Results

A total of 66 patients were diagnosed with intussusception within the study period. There were 38 male (57.6%) and 28 female (42.4%) patients (male:female = 1.4:1).

The age range was 3–84 months and the mean age was  $12.0 \pm 30.8$  months.

Twenty-six patients underwent hydrostatic reduction, of which 11 (42.3%) were successful. There was a case of recurrence in a 5-month-old patient that occurred within 2 days of successful hydrostatic reduction, requiring an open reduction.

There was no strong correlation between the age of the patient at presentation, the number of attempts at hydrostatic reduction, the volume of fluid used, and the outcome following hydrostatic reduction ( $P > 0.05$ ).

There was, however, a correlation between duration of symptoms and successful hydrostatic reduction ( $P < 0.05$ ), with five of the 11 successful reductions (45.5%) presenting within 24 h of the symptoms.

## Discussion

Childhood intussusception is the most common cause of intestinal obstruction in our centre and accounts for a

significant percentage of the emergency workload in our unit. The incidence of childhood intussusception in the current study has not changed from that reported from our centre a few years back [8]. Our findings are similar to that of other hospital-based studies in Nigeria. Olayiwola *et al.* [9] reported an annual incidence of 33 cases. The male to female ratio in our study was 1.4:1. This finding is similar to that of Archibong in Calabar, Nigeria [10].

We observed seasonality in the incidence, which is comparable to a similar study conducted in the same centre 6 years ago [8]. Our observation, however, is at variance with the review of Mpabalwani and colleagues of nine hospitals in Zambia in which no seasonality was reported [11]. The incidence of intussusception from our study peaked in the months of October/November and February/March (21.2 and 19.7%, respectively), with the former month coinciding with the period of transition from the rainy to winter season and the latter the converse.

In our study, 26 (39.4%) out of 66 patients underwent hydrostatic reduction, of which 11 (42.3%) were successful. This figure differs significantly from that of an earlier study in our centre in which 97.1% of patients underwent surgical exploration [8]. At the time of that study, hydrostatic reduction had not been introduced at our centre and the higher incidence of complicated cases precluded nonoperative management.

With respect to eligibility for hydrostatic reduction, our results are similar to that of Ogundoyin and colleagues in Ibadan, who quoted a value of 42.9% and obtained a 58.3% success rate [12]. Olayiwola *et al.* [9] reported a 100% surgical intervention rate as hydrostatic reduction was not in the offing during their study. The findings in both our study and that of Ogundoyin and colleagues are much lower than that of Mensah in Ghana, who recorded a 75% success rate [4]. Krishnakumar Hameed *et al.* [13] in India recorded a 96% success rate in hydrostatic reduction performed in 25 patients during a 2-year study period, whereas Alehossein *et al.* [14] in Iran documented a 81.5% success rate for hydrostatic reduction performed in 27 children over 10 years. Similarly, Menke and colleagues in Germany obtained an 83.7% success rate in 47 infants presenting with intussusception over a 9-year period [15].

We cannot categorically state the reason for the low success rate we obtained in our study. However, we observed a correlation between duration of symptoms and successful hydrostatic reduction ( $P < 0.05$ ), with five of the 11 successful reductions (45.5%) presenting within 24 h of the symptoms. This observation differs from that of both Ogundoyin *et al.* and Van den Ende *et al.* [16], who witnessed no such correlation. We suggest hydrostatic reduction as first-line treatment regardless of duration as long as it does not have features of peritonitis and shock as over half of our patients who were successfully reduced presented beyond 24 h after the onset of symptoms. This is particularly important in sub-Saharan Africa where delayed presentation is prevalent with reduced uptake of nonoperative management of intussusception. Our current study shows that hydrostatic reduction is still feasible in such settings, with significantly reduced need

for bowel resection. The rate of open reduction has reduced from 97.1 to 60.6%. Another additional advantage is that nonoperative hydrostatic reduction costs less, and in our setting, where healthcare costs of children are borne by parents as out-of-pocket expenditure, that is a significant consideration in the choice of therapeutic choices.

There was no strong correlation between the age of the patient at presentation and successful hydrostatic reduction in our study. This is at variance with the findings of Ogundoyin and colleagues, who noted that the success rates decreased with increasing age of their patients after the age of 1 year. They attributed this to higher rates of lead points in older patients, which would make hydrostatic reduction less successful.

We did not observe any pathological lead point in any of the failed hydrostatic reductions intraoperatively.

## Conclusion

Although less than half of the patients presenting with childhood intussusception were eligible for hydrostatic reduction, the method remains a feasible option in our environment in spite of late presentation by most of our patients. The duration of presenting symptoms was the most important determinant of successful hydrostatic reduction.

## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

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